Final Exam Review

Computer Science Department
University of Central Florida

COP 3502 – Computer Science I

Final Exam Review

- Outline of Material Covered:
  1. Arrays, Pointers, Strings, Files, Structs
     - Manipulation of array elements
     - Manipulation of struct components
       - Use of '.' vs '->'
     - Use of strings
       - strcmp, strlen, strcpy
     - Use of files (fopen, fscanf)
     - Dynamic memory allocation for arrays and for structs
       - malloc, calloc, and realloc

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- Outline of Material Covered:
  - II. Linked Lists
    - Traversing a linked lists
      - Printing a list
      - Modifying list contents
    - How to allocate a node dynamically
    - Inserting elements anywhere in the list
    - Deleting elements anywhere in the list
      - Everything is fair game including insert/delete.
      - Know the code!

Final Exam Review

- Outline of Material Covered:
  - III. Recursion
    - Fibonacci, Factorial, Binary Search
    - Writing recursive functions
    - Tracing through recursive functions
    - Towers of Hanoi
    - Permutation
    - Reversing a string
    - Base conversion
      - Convert from some other base to base 10
      - Convert from base 10 to some other base
      - ***Convert from ANY base to ANY other base***

Final Exam Review

- Outline of Material Covered:
  - IV. Algorithm Analysis
    - Big-O definition and finding the c value as shown in class
      - Understanding the various orders and what they mean
    - “Practical” Problems such as those on the slides and also during the lab
    - Analyzing code fragments and determining Big-O
    - Solving summations
    - Putting summations in their closed form (in terms of n)
    - Analyzing code fragments and using summations to determine the Big-O

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- Outline of Material Covered:
  - V. Recurrence Relations
    - **You will have at LEAST one full recurrence relation to work out**
      - This will be a 15 point question
      - We have done SEVERAL of these in class
        - No excuse at all to miss this question
    - You may have other smaller questions on this topic:
      - Given several equals representing several steps of the recursion, give the correct recurrence relation for the kth step
      - Given code, develop the recurrence relation
        - But don't actually solve it
      - And other similar questions on the topic

Final Exam Review

- Outline of Material Covered:
  - VI. Stacks
    - What they are and how they work
    - The idea of Abstract Data Types
    - Stack operations
    - Converting Infix to Postfix
    - Evaluating Postfix expressions
    - Implementation of stacks using arrays and linked lists
      - Understand how the code works!

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- Outline of Material Covered:

VII. Queues

- What they are and how they work
- Basic operations of a queue
- Different implementations of a queue
  - Both regular array implementations
    - Be able to explain the problems with these two methods
  - Circular array implementation
    - Be able to explain why this one is better
  - Linked list implementation
- Be able to answer short questions on coding queues
- Know when to use a queue versus a stack

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- Outline of Material Covered:

VIII. Binary Trees

- Basic info on trees
  - root, leaves, height, # of nodes, complete tree, full tree, etc
- What is a BST (ordering property)
- Implementation of a BST
- Tree traversals
  - Depth first (preorder, inorder, postorder) and breadth first

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- Outline of Material Covered:
  - IX. Binary Trees
    - Insertion into a BST
      - Given a list of values, know how to make a tree inserting those values into the tree
      - Know the code for insertion
    - Deletion from a BST
      - Know the three cases and understand how to delete
    - Various functions
      - You WILL have a coding question on the test
        - Most likely to code some type of function on binary trees
      - Between the slides and lab sheets, you have more than a DOZEN examples. Make sure you are okay with them.

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- Outline of Material Covered:
  - X. Sorting
    - Know running times of all sorts!
    - Know the N-squared sorts
      - Be able to show the step-by-step sorting of a list of values using any of these sorting methods
      - Just like what was shown in lab
      - Understand the limitation of these sorting algorithms
    - Merge Sort
      - Know how it works and be okay with the analysis of it
      - Understand the merge function
    - Quick Sort
      - Partition, best type of pivot, and analysis of quick sort

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- Outline of Material Covered:
  - XI. Backtracking
    - Understand what is backtracking
      - How does backtracking differ from an exhaustive search?
    - Understand the N-queens problem
      - Know how to implement the problem using stacks
      - Be able to do an example if asked

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- Outline of Material Covered:
  - XII. Heaps
    - What is a heap and what is its purpose?
      - What are the properties of a binary heap?
      - Know the variations of a heap
    - Know how to add nodes to a heap
      - Where to add and then what to do afterwards
      - Percolate up
    - Know how to delete from a heap
      - Where do we delete from? And what do we do afterwards?
      - Percolate down
    - Know how to build a heap from scratch
    - Understand the analysis of Heapify resulting in O(n)

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- Outline of Material Covered:

XIII. Hash Tables

- Know why we use hash tables
- Understand the use of hash functions
- Know what collisions are
- Know the different collision resolution methods:
  - Linear probing
  - Quadratic probing
  - Double hashing
  - Bucket hashing
  - Separate chaining
- Be able to compare and contrast resolution methods

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- Outline of Material Covered:
  - XIV. AVL Trees
    - Know what is an AVL tree and what is its purpose
    - Know how to insert node into an AVL tree
    - Know how to delete nodes from an AVL tree
    - Know how to fix an imbalances that occur
      - You can use EITHER the rotate method
      - Or the A,B,C method
    - Know how to create a tree from a list of nodes
      - Just a series of insertions

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- Outline of Material Covered:

XV. Graphs

- Know the various graph terminologies
- Understand how to represent a graph
  - Adjacency matrix
- Be able to construct an adjacency matrix from a graph

- Graph Traversal algorithms as shown in class
  - Depth first
  - Breadth first
  - Do NOT worry about these
  - You will NOT be tested on them

Final Exam Review

- How to study:
  - KNOW and UNDERSTAND the notes
  - Make sure you are 100% on the notes
  - Make sure you are 100% on all the lab questions and their respective solutions
  - Don’t waste time memorizing algorithms
    - Understand how they work and WHY they work
    - And be prepared to come up with your own
  - Look at the archive of Foundation Exams
    - Practice some of the problems (ones that are applicable)
    - http://www.cs.ucf.edu/registration/exm/index.html

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- Types of Questions:
  - Some short answer questions:
    - Tracing through code
    - Questions on an algorithm discussed in class
    - Small questions on code
    - etc.
  - Writing Functions:
    - You will have to write functions
    - Perhaps on binary trees or on Heaps
      - And usually will be recursive

Final Exam Review

- Exam Aids:
  - You may use TWO 8-1/2”x11” sheets of paper
    - FRONT AND BACK
    - Typed or written doesn’t matter
    - I don’t care what you put on it
  - What you CANNOT use:
    - Any electronic device:
      - Calculator, phone, ipad, you get the idea
    - If you are seen holding ANY electronic device, you will get 10 points off immediately! If you were cheating with that device, then the consequences are, of course, far worse.

Final Exam Review

- So what is covered?
  - EVERYTHING taught this semester
  - Even if I didn't "cover" it during this review
  - Anything and everything that was taught or shown in class or in the labs is fair game.
    - Including material from the first two exams

Questions:

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